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UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

REDUCING "NIPPING" HAZARDS WHEN TRAMMING COAL-MINING MACHINERY[1]

By E. J. Gleim[2]

In the movement of self-propelled direct-current machinery, particularly shortwall cutting machines, from one place to another in coal mines, "nipping" or "stinging" has been practiced quite commonly. These terms refer to the method of obtaining current for propelling or tramming the machines along trolley haulageways by sliding the trolley tap (hook or nip), which terminates one conductor of the trailing cable, along the trolley wire. This is usually done by the machine operator or runner while sitting on the machine truck and holding the nip terminal against the trolley wire as the machine travels along the rails.

This procedure is objectionable for several reasons. Under the best conditions, the area of contact between the nip and trolley wire is small and, consequently, sparking and flashing are most likely to be continuous as the machine proceeds. This is undesirable, not only because of the detrimental effect of electric flashes upon eyesight, but because of the pitting and roughening of the trolley wire, which decrease the efficiency of current collection by locomotive trolley wheels and shoes and at the same time shorten their useful life by increased wear.

Where considerable distances are to be traversed in getting to and from the working place it is tiring, no doubt, to hold the commercial fused type of nip at arm's length. This probably is one reason why the fused nip is frequently discarded in favor of a lighter "home-made" type consisting of a piece of trolley wire 12 inches to 3 feet long held by friction tape to a stick that serves as a handle. Without the proper fuse protection in the trolley nip, a short-circuit in the trailing cable may result in destruction of the cable by fire. In addition to the loss of cable, there is also the danger of igniting coal in contact with it and thereby starting a mine fire.

In the past, there have been instances of the shattering of the casings of fused trolley taps by blown fuses. This usually can be traced to overfusing. Although destruction of casings can be largely or wholly eliminated in the latest commercial types of fused taps by the use of the correct size of fuse, the hazard is not to be overlooked if conditions are conducive to overfusing and improper assembly of the trolley tap.

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[1] The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from Bureau of Mines Information Circular 7056."

[2] Electrical engineer, Electrical-Mechanical Section, Mining Division, Bureau of Mines, Central Experiment Station, Pittsburgh, Pa.

Another hazard in the practice of nipping arises when the operator permits his machine to coast down-grade with the nip out of contact with the trolley wire. Under this condition, the motor becomes a generator. Then, if the operator has not shut off his controller, the terminal of the nip will be alive, and contact with it may result in severe shock. The attention of the Bureau of Mines has been called to one electrocution that was caused in this way.

Accidental or intentional loss of contact between trolley nip and wire also has resulted in damage to equipment, especially that in which magnetic control is employed. If the machine is in motion, momentary removal of the nip may not give a long enough interval for protecting relays and contactors to function; and then, when connection is reestablished, a flash-over may occur in the motor.

The reduction of the hazards mentioned is not difficult to accomplish and has been done by attaching what the Bureau terms a "rolling contact" to the machine truck. In effect, this is simply a trolley wheel and harp on a wood pole that is mounted on the truck in a suitable bracket or socket in much the same manner as a trolley pole is mounted on a mine locomotive. The important difference between the locomotive trolley pole and the arrangement described is that in the latter there is no permanent electrical connection between the trolley harp and any electrical terminal within the machine. Instead, the harp is provided with a clip to hold the fused trolley tap securely while its hook is firmly kept in contact with a substantial terminal. (Some variations in the foregoing construction have been followed by the different manufacturers.)

In operation, the machine runner connects the trolley tap to the pole and harp before the trolley wheel is placed against the trolley wire. The ground connection of the other conductor of the trailing cable with the machine frame also is completed before the trolley wheel is placed against the wire. When he is ready to proceed to his working place, the machine runner puts the wheel against the wire and then trams along without needing to hold either cable or trolley tap in his hands. Upon reaching the point where he must leave the trolley wire, the machine runner first pulls down the pole and then removes the trolley tap. He then connects the ground terminal of the cable to the rail, and, finally, the trolley tap is hooked over the trolley wire or under a hanger. The trolley wheel and harp of the rolling contact are now "dead", and the machine can be moved to the working place with the cable unreeling in the usual way.

From the foregoing, it will be seen that with the rolling contact, tramming of the machine without holding an energized trolley tap in the hand is made possible. This should enable the machine runner to keep his head at a greater distance from the trolley wire while the machine is moving and thereby decrease the possibility of receiving a shock from contact with the wire. Furthermore, it should make it unnecessary for him to sit on the

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cable and risk being burned should the cable become grounded against metal parts used as a seat. With enough spring pressure to hold up the pole, the rolling wheel or contact makes considerably better connection with the trolley wire than possibly can be made by sliding one wire over another. Thus, sparking and flasking are reduced to a minimum, and at the same time the possibility of damage to eyesight and wire is decreased. The danger of the rolling contact leaving the trolley wire is much less than with the nip. This should mean that the use of the rolling contact will minimize injuries to men and machines as the result of coasting.

The rolling contact has been added to a number of permissible mining machines, and the Bureau of Mines has authorized this addition by extending approvals to machine manufacturers who satisfy the requirements and file acceptable drawings with the Bureau to show the arrangement adopted. Therefore, anyone wishing to add this safety feature to permissible equipment should obtain the authorized arrangement in which engineers of the manufacturer and the Bureau have cooperated to obtain a design eminently suitable for reducing the hazards of nipping.